779

# THE DESCRIPTION AND VSE OF HIS MAIESTIES DIALS IN WHITE-HALL GARDEN.

LONDON,
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IOHN BILL, Printers to the Kings
*moſt Excellent Maieſtie.*
MDCXXIV.

24

# TO
# HIS SACRED
# MAIESTIE.

SIR,

*IT was the motion of many Honorable Perſonages, and the ſpeciall direction of the Prince his Highneſſe, that I ſhould write* the Deſcription and Vſe *of ſuch Lines, as I had drawen on Your* MAIESTIES *Dials in* White-Hall *Garden.*

*I haue endeauoured to giue ſatiſfaction vnto all: To Your Maieſtie, and his Highneſſe, by the manuſcript which I deliuered; And that, being here Printed by order from Your Maieſtie, may be ſatisfaction for them alſo, which haue acceſſe into the Garden.*

*Garden. For others (ſtudious of* Mathematicall *Practiſe) I haue Printed the* Generall Deſcription *of theſe and ſuch like Lines, on all ſorts of Planes; together with ſome Vſes of* Aſtronomie *in Nauigation.*

*I humbly entreat Your Maieſtie to accept theſe poore fruits of my younger* Studies, *when I was Your Maieſties Scholler in* Weſtminſter *and* Chriſtchurch: *and I ſhall be ready to doe all ſeruice in this kinde, or better in the Church, as Your Maieſty ſhall be pleaſed to thinke me worthy, in the name of*

Your Maieſties
most thankefull Scholler,
and obedient Subiect,

***Edm. Gunter.***

# THE DESCRIPTION and vſe of his MAIESTIES *Dials in Whitehall Garden.*

THe ſtone whereon the Dials are deſcribed, is of the ſame length, bredth, and depth, with that which ſtood in the ſame place before. That, was of *Cane* ſtone, and of many pieces: this, all of one intire ſtone from *Purbecke* Quarrie. The baſe of it is a ſquare of ſomewhat more then foure foote and a halfe; the height three foote and ¼: and ſo vnwrought contained about 80. feete, or fiue Tonne of Stone.

It is alſo wrought with the like *Plaines* and *Concaues* as the former; and ſo neceſſarily, the like lines to ſhewe the houre of the day. But the reſt of the lines are much different, and moſt of them ſuch as were not in the former Dials, and therefore I intend here to giue an account of them.

Theſe Dials may bee diſtinguiſhed according as they are deſcribed: either on the vpper part of the Stone; or on the ſides, toward the *Eaſt, Weſt, North, South.*

There be fiue Dialls deſcribed on the vpper part: foure on the foure Corners; and one in the middle, which is the chiefeſt of all, the great *Horizontall Concaue*.

# *The vſe of the Circles on the Margent of the great* Horizontall Concaue.

THe *Margent* of this *Horizontall Concaue* containeth foure Circles: whereof, the *Vttermoſt* is the *Circle of the xij Moneths*, conteining the ſeuerall dayes, the *Dominicall letters*, and the *ſtanding Feſtiualls*: The *Holy dayes*, in *Redde*; The *Garter* dayes in *Blue*, and the common *Saints dayes* in *Blacke*. The vſe of them may be;

## 1. *To find the day of the Moneth belonging to the Feſtiuall.*

THe *Feſtiuall* dayes are here ſet at the day of the *Moneth*, wherein they fall: As, the Feaſt of S. *George*, at the xxiij of *Aprill*; the Feaſt of S. *Iames* at the xxv of *Iuly*; and ſo the reſt of the *ſtanding Feſtiuals*. *Eaſter*, *Whitſontide*, and ſuch like, could not bee ſet downe, becauſe they are moueable.

## 2. *To finde the day of the Weeke belonging to the Feſtiuall.*

FIrſt, conſider ſome one day, which you know to fall on ſuch a day of the weeke: that one may helpe you to find all the reſt. As, knowing, that this yeere MDCXXIV. S. *Georges* day fell on the ***Friday***; if you looke into this Circle, you ſhall finde it ouer againſt the letter ***A***: then is ***A.*** the letter for ***Friday***; *B.* for ***Saturday***, and *C.* the *Dominicall letter* for this yeere: and ſo, the reſt in their order. If now you would knowe, what day of the ***Weeke*** *Chriſtmas* day falleth; looke into the moneth of ***December***, and there you ſhall find it ouer againſt the letter ***B***: which ſheweth, that *Chriſtmas* day, this yeere, falleth on ***Saturday***.

The ſecond Circle is of the twelue

*Signes* : ♈ *Aries* : ♉ *Taurus* : ♊ *Gemini* : ♋ *Cancer* : ♌ *Leo* : ♍ *Virgo* : ♎ *Libra* : ♏ *Scorpio* : ♐ *Sagittarius* : ♑ *Capricornus* : ♒ *Aquarius* : ♓ *Piſces* : Each *Signe* being diſtinguiſhed with his name and character, and diuided into 30. degrees. The vſe of it may be,

## *The Day of the Moneth being knowen, to finde the Place of the Sunne.*

THe day of the *Moneth*, and the *Place of the Sunne*, are here ſet, one againſt the other: So may you find, that on the xxiij. of *April*, being S. *Georges* day, the *Sunne* is in 13. Deg. of ♉. On the xxv. of *Iuly*, being S. *Iames* his day, the *Sunne* is in 11. Degrees, 50. Minutes of *Leo*.

There may be ſome ſmall difference in time to come, in regard of the Leape yeere, as, of a quarter of a Degree, more or leſſe; but, that could not be auoided. And this may ſerue for ſixe ſcore yeeres without one Degrees difference.

The third *Circle*, is a ſtanding *Compaſſe*, diuided into thirty two points, with the name of each point in his due place: whereby you may ſee, vpon what point the *Sunne* beareth, and how the winde bloweth.

The fourth and innermoſt *Circle* containeth another deſcription of the *dayes* of each moneth, fitted to the *Concaue*.

## *The deſcription of the Concaue.*

THe *Concaue* is twentie inches deepe, and fourtie inches ouer: and being halfe round reſembleth that halfe of the heauens which may be ſeene.

The one part, which is drawen vpon the *white* ground, reſembleth ſo much of the heauens, as is contained betweene the *Tropiques*. As, there, the *Sunne* hath all varietie of motion; ſo, heere, the *point* of the *Style*, all variety of ſhadow. The other part, which is on the *Blue* ground, is that part of the heauen, where the *Sunne* neuer commeth.

The *Style* belonging to the *Concaue*, is xx inches long, and about xiij inches broad at the foot. The one edge which is vpright, is the *Axis* of the *Horizon*, and with his ſhadow ſheweth the *Azimuth*.

The other edge, inclining to the *North*, repreſents the *Axis* of the world, and with his ſhadow ſhewes the time of the day. The point of the *ſtyle*, with his ſhadow, will ſhew the reſt of the concluſions.

The edge of the *Concaue* repreſenteth the circle of the *Horizon*. The other ſeuerall Circles deſcribed in the *Concaue*, may be knowen and diſtinguiſhed by their colours.

The *Æquator*, the *Tropiques*, and the *Ecliptique*, and the *Parallels* of *Declination*, are all drawen in *Red* lines.

The *Parallels* of the *Horizon*, to ſhew the *Sunnes altitude*, in *Yellow*.

The *Verticall* circles are drawen in *Blew*.

The olde *vnæquall* (which ſome call *Planetarie*) *houres*, in *Greene*.

The *common* houres, in *Blacke*.

The *dayes* fitted to the *Sunnes riſing* and *ſetting*, are drawen in the *margent*. And, ſo much is intimated in thoſe eight Latine verſes, which are written on the *Concaue*:

Aequator, Tropiciq; & Declinatio Solis,
*Et* Via Solaris *tramite ducta* rubro.
Lineolis flauis, Solis conſcenſus *habetur*;
Cæruleo tractu, Verticis vmbra *cadit*.
Hora Planetarum, Viridi *eſt ſignata* colore:
Horaq; Vulgaris *nota* colore nigro.
Ortus & Occaſus Solis, Spaciumq; diei,
*Atque* Dies menſis, Margine *ſcripta patent*.

## *The vſe of the* Blacke Lines.

THat Line which is drawen from the South to the North, whereon the *Style* is ſet, is the *Meridian* circle. The reſt drawen on either ſide of the *Meridian*, in *White* vpon the *Blue*; and in

*Blacke* vpon the *White* ground, are the *Houre* circles. Thoſe which doe ſhew the *houres* complete, are drawen with broader lines. Each houre is diuided, firſt into fifteene parts with ſmall lines, euery part being foure minutes: And each part is againe ſubdiuided into foure parts more, with little *blacke* ſtrokes, at the beginning, middle, and end of the former lines: And ſo, the whole houre is actually diuided into ſixtie *Minutes*. Of which, that line which ſignifieth twentie *Minutes*, and, that which ſignifieth 40. *Minutes* complete, are, for diſtinction ſake, croſſed with little *Redde* ſtrokes. The vſe of them may be,

## 1. *To ſhew the* Houre *and* Minute *of the day by the ſhadow of the* Style.

THe *houre* of the day will be found, at one time or other, in more then fourеſcore ſeuerall places of this Stone: but no where ſo well, as in this *Horizon-*

*tall Concaue*. For, the *houre* is ſound on the Eaſt ſide of the Stone, onely in the morning; and on the Weſt ſide, onely in the euening: On the South ſide, onely in the middle of the day; on the North ſide, either early in the morning, or late in the euening: On the *Æquinoctiall plaines*, either onely in the Summer, or onely in the Winter: Here, it is ſound generally, both in Summer and Winter, morning and euening, and at all houres of the day. Not onely, the *houre* and *quarter*, (as in the reſt of theſe Dials) but, the *houre* and *minute*: with many other concluſions anſwerable, which may not be expected in any Diall of another forme.

When the Sunne ſhineth, obſerue the ſhadow of the *Style* among the *houre* lines; the ſhadow of the one edge will commonly croſſe the *houre* lines, and ſo, is vnfit for this purpoſe; but the ſhadow of the other edge, which leanes to the Northward, will alwayes fall, either betweene two *houre* lines, or vpon one of them; and the *houre* line, where it falleth, will giue the *houre* and *minute* required.

## 2. *To ſhew the houre and minute of the* Sunnes *riſing and ſetting, and the length of the Day, at all times of the yere, though the* Sunne *doe not ſhine.*

FIrſt, find the *day* of the moneth, in the *inner* circle of the *Margent*; (which, from the eleuenth of *December* vntill the eleuenth of *Iune*, while the dayes are encreaſing, will be found on the *Weſt* part of the *Concaue*;) and there, the *houre line* which is drawen vp to the *Day*, will giue you the *houre* and *minute* of the *Sunnes riſing*. But, from the eleuenth of *Iune* vntill the eleuenth of *December*, while the dayes are decreaſing, the *Day* will be found on the *Eaſt* ſide of the *Concaue*: and there, the *houre* line which is drawen vp to the *Day*, will giue the *houre* and *minute* of the *Sunnes ſetting*: and, the one being knowen will giue the other.

As, if it were required, to know, what time the *Sunne riſeth* and *ſetteth*, on the fourth day of *Februarie*. This moneth is found on the Weſt part of the *Concaue*; and the *houre-line*, which meeteth with the fourth day of this moneth, is that of 7. *Ho*. 8. *Min* in the morning; and, ſuch is the time of the *Sunnes riſing*: But, ſo much as the *Sunne riſeth* before noone, ſo much he *ſetteth* after noone, within a minute more or leſſe, and therefore the time of the *Sunnes ſetting* is about 4. Ho. 52. Minutes after noone.

## 3. *To ſhew the day of the moneth, when the Sunne riſeth or ſetteth at any houre and minute.*

ON the contrary, if you would finde the *Day*, when the *Sunne riſeth* or *ſetteth* at any houre, Firſt find the *houre-line* in the *Concaue*, and that will leade you to the day of the moneth in the *Margent.*

As, if it were required, On what **Day** the *Sunne* riſeth at fiue in the morning: firſt finde the ***houre-line*** of fiue, in the Weſt part of the *Concaue*, and that will leade you to the tenth day of *April.* Then, becauſe the *Sunne*, *riſing* at fiue, doeth *ſet* at ſeuen, if you finde out the ***houre-line*** of ſeuen after noone, it will leade you to the thirteenth day of *Auguſt*, which ſhewes, that the *Sunne* riſeth at fiue in the morning, and ſetteth at ſeuen after noone, both on the tenth day of *April*, and the thirteenth of *Auguſt.*

The like reaſon holdeth for the *riſing* and *ſetting* of the *Sunne* at all other times of the yeere: as may appeare, by comparing the *Concaue* with the *Table* following.

## *A Table for the Houre and Minute of the Sunne.*

| Day. | *Ianuary* |  | *February* |  | *March.* |  | *April.* |  | *May.* |  | *Iune.* |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  | *Ho.* | *Mi.* | *Ho.* | *Mi.* | *Ho.* | *Mi.* | *Ho.* | *Mi.* | *Ho* | *Mi.* | *Ho.* | *Mi.* |
| 1 | 3 | 59 | 4 | 47 | 5 | 42 | 6 | 44 | 7 | 37 | 8 | 10 |
| 2 | 4 | 1 | 4 | 49 | 5 | 44 | 6 | 45 | 7 | 38 | 8 | 11 |
| 3 | 4 | 2 | 4 | 50 | 5 | 46 | 6 | 47 | 7 | 40 | 8 | 11 |
| 4 | 4 | 3 | 4 | 52 | 5 | 48 | 6 | 49 | 7 | 41 | 8 | 11 |
| 5 | 4 | 4 | 4 | 54 | 5 | 50 | 6 | 50 | 7 | 43 | 8 | 12 |
| 6 | 4 | 5 | 4 | 56 | 5 | 52 | 6 | 51 | 7 | 44 | 8 | 12 |
| 7 | 4 | 6 | 4 | 58 | 5 | 54 | 6 | 53 | 7 | 46 | 8 | 12 |
| 8 | 4 | 7 | 5 | 0 | 5 | 56 | 6 | 55 | 7 | 47 | 8 | 12 |
| 9 | 4 | 8 | 5 | 2 | 5 | 58 | 6 | 57 | 7 | 48 | 8 | 13 |
| 10 | 4 | 10 | 5 | 4 | 6 | 0 | 6 | 59 | 7 | 49 | 8 | 13 |
| 11 | 4 | 11 | 5 | 6 | 6 | 2 | 7 | 1 | 7 | 51 | 8 | 13 |
| 12 | 4 | 13 | 5 | 8 | 6 | 4 | 7 | 3 | 7 | 52 | 8 | 13 |
| 13 | 4 | 14 | 5 | 10 | 6 | 6 | 7 | 5 | 7 | 53 | 8 | 13 |
| 14 | 4 | 16 | 5 | 12 | 6 | 8 | 7 | 7 | 7 | 55 | 8 | 13 |
| 15 | 4 | 17 | 5 | 14 | 6 | 10 | 7 | 9 | 7 | 56 | 8 | 13 |
| 16 | 4 | 19 | 5 | 16 | 6 | 12 | 7 | 11 | 7 | 57 | 8 | 12 |
| 17 | 4 | 20 | 5 | 18 | 6 | 14 | 7 | 13 | 7 | 58 | 8 | 12 |
| 18 | 4 | 22 | 5 | 20 | 6 | 16 | 7 | 15 | 7 | 59 | 8 | 12 |
| 19 | 4 | 24 | 5 | 22 | 6 | 18 | 7 | 16 | 8 | 0 | 8 | 11 |
| 20 | 4 | 25 | 5 | 24 | 6 | 20 | 7 | 18 | 8 | 1 | 8 | 11 |
| 21 | 4 | 27 | 5 | 26 | 6 | 22 | 7 | 20 | 8 | 2 | 8 | 10 |
| 22 | 4 | 29 | 5 | 28 | 6 | 24 | 7 | 22 | 8 | 3 | 8 | 10 |
| 23 | 4 | 30 | 5 | 30 | 6 | 26 | 7 | 24 | 8 | 4 | 8 | 10 |
| 24 | 4 | 32 | 5 | 32 | 6 | 28 | 7 | 25 | 8 | 5 | 8 | 9 |
| 25 | 4 | 34 | 5 | 34 | 6 | 30 | 7 | 27 | 8 | 6 | 8 | 9 |
| 26 | 4 | 36 | 5 | 36 | 6 | 32 | 7 | 28 | 8 | 6 | 8 | 8 |
| 27 | 4 | 38 | 5 | 38 | 6 | 34 | 7 | 30 | 8 | 7 | 8 | 7 |
| 28 | 4 | 40 | 5 | 40 | 6 | 36 | 7 | 32 | 8 | 8 | 8 | 6 |
| 29 | 4 | 41 |  |  | 6 | 38 | 7 | 34 | 8 | 9 | 8 | 5 |
| 30 | 4 | 43 |  |  | 6 | 40 | 7 | 35 | 8 | 9 | 8 | 5 |
| 31 | 4 | 45 |  |  | 6 | 42 |  |  | 8 | 10 |  |  |

*ſetting for euery day in the yeere.*

| *Iuly.* | | *Auguſt* | | *Septemb.* | | *October.* | | *Nouemb.* | | *Decemb.* | | *Day.* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Ho.* | *Mi.* | *Ho.* | *Mi.* | *Ho.* | *Mi.* | *Ho.* | *Mi.* | *Ho.* | *Mi.* | *Ho.* | *Mi.* | |
| 8 | 4 | 7 | 22 | 6 | 23 | 5 | 24 | 4 | 26 | 3 | 50 | 1 |
| 8 | 3 | 7 | 20 | 6 | 21 | 5 | 22 | 4 | 25 | 3 | 50 | 2 |
| 8 | 2 | 7 | 18 | 6 | 19 | 5 | 20 | 4 | 23 | 3 | 49 | 3 |
| 8 | 1 | 7 | 16 | 6 | 18 | 5 | 18 | 4 | 21 | 3 | 49 | 4 |
| 8 | 0 | 7 | 14 | 6 | 16 | 5 | 16 | 4 | 20 | 3 | 48 | 5 |
| 7 | 59 | 7 | 13 | 6 | 14 | 5 | 14 | 4 | 18 | 3 | 48 | 6 |
| 7 | 57 | 7 | 11 | 6 | 12 | 5 | 12 | 4 | 16 | 3 | 48 | 7 |
| 7 | 56 | 7 | 9 | 6 | 10 | 5 | 10 | 4 | 15 | 3 | 47 | 8 |
| 7 | 55 | 7 | 7 | 6 | 8 | 5 | 8 | 4 | 13 | 3 | 47 | 9 |
| 7 | 54 | 7 | 6 | 6 | 6 | 5 | 6 | 4 | 12 | 3 | 47 | 10 |
| 7 | 53 | 7 | 4 | 6 | 4 | 5 | 5 | 4 | 11 | 3 | 47 | 11 |
| 7 | 52 | 7 | 2 | 6 | 2 | 5 | 3 | 4 | 10 | 3 | 47 | 12 |
| 7 | 50 | 7 | 0 | 6 | 0 | 5 | 1 | 4 | 8 | 3 | 47 | 13 |
| 7 | 49 | 6 | 58 | 5 | 58 | 4 | 59 | 4 | 7 | 3 | 47 | 14 |
| 7 | 48 | 6 | 56 | 5 | 56 | 4 | 57 | 4 | 5 | 3 | 47 | 15 |
| 7 | 46 | 6 | 54 | 5 | 54 | 4 | 55 | 4 | 4 | 3 | 47 | 16 |
| 7 | 45 | 6 | 52 | 5 | 52 | 4 | 53 | 4 | 3 | 3 | 48 | 17 |
| 7 | 44 | 6 | 50 | 5 | 50 | 4 | 51 | 4 | 2 | 3 | 48 | 18 |
| 7 | 42 | 6 | 48 | 5 | 48 | 4 | 49 | 4 | 0 | 3 | 48 | 19 |
| 7 | 41 | 6 | 46 | 5 | 46 | 4 | 47 | 3 | 59 | 3 | 49 | 20 |
| 7 | 39 | 6 | 45 | 5 | 44 | 4 | 46 | 3 | 58 | 3 | 49 | 21 |
| 7 | 38 | 6 | 43 | 5 | 42 | 4 | 44 | 3 | 57 | 3 | 50 | 22 |
| 7 | 36 | 6 | 41 | 5 | 40 | 4 | 42 | 3 | 56 | 3 | 50 | 23 |
| 7 | 35 | 6 | 39 | 5 | 38 | 4 | 41 | 3 | 55 | 3 | 51 | 24 |
| 7 | 33 | 6 | 37 | 5 | 36 | 4 | 39 | 3 | 54 | 3 | 52 | 25 |
| 7 | 31 | 6 | 35 | 5 | 34 | 4 | 37 | 3 | 54 | 3 | 53 | 26 |
| 7 | 30 | 6 | 33 | 5 | 32 | 4 | 35 | 3 | 53 | 3 | 54 | 27 |
| 7 | 28 | 6 | 31 | 5 | 30 | 4 | 33 | 3 | 52 | 3 | 55 | 28 |
| 7 | 26 | 6 | 29 | 5 | 28 | 4 | 31 | 3 | 51 | 3 | 56 | 29 |
| 7 | 25 | 6 | 27 | 5 | 26 | 4 | 30 | 3 | 51 | 3 | 57 | 30 |
| 7 | 23 | 6 | 25 | | | 4 | 28 | | | 3 | 58 | 31 |

The *Concaue* and this *Table* are both made for the *Latitude* of 51.*gr*.30. ſeruing for *London*, & ſuch places as lie *Eaſt* or *Weſt* from *London* in the ſame *Latitude*. But, if you goe from *London*, either Northward or Southward, there will be ſome ſmall difference. For, here at *London*, vpon the longeſt day, the *Sunne ſetteth* at 8. *Hou*. 13. *Min*. and ſo the *length of the day* is 16. *Houres*, 26. *Minutes*. About Sillie, and the *Lizard*, the Southermoſt parts of *England*, in the *Latitude* of 50.*gr*. the *Sunne ſetteth* at 8. *Ho*. 5. *Min*. And ſo, their *longeſt day* is about 16. *Ho*. 10. *Min*.

About an hundred miles Northward from *London*, the *Sunne ſetteth* at 8. *Ho*. 22. *Min*. And ſo, their *longeſt day* is 16. *Hou*. 44. *Minutes*.

About *Edenborough* in the *Latitude* of 56.*gr*. the *Sunne ſetteth* at 8. *Ho*. 40. *Min*. And ſo, their *longeſt day* is 17. *Houres*, 20. *Minutes*.

About the *Orcades*, in the *Latitude* of 60.*gr*. the *Sunne ſetteth* at 9. Ho. 15. *Min*.

And ſo, their *longeſt day* is 18. *Houres*, 30. *Minutes*.

## *The vſe of the Red Lines.*

THe *Red Lines*, drawne croſſe the the *Houre lines*, are of ſeuerall ſortes, all tending to ſhew the motion of the *Sunne*. That which is drawne in the middle of the *White* ground, directly from Eaſt to Weſt, is the *Aequator*.

The other two, which are drawne from Weſt to Eaſt, diuided into degrees, and noted with ♈ ♉ ♊, &c. doe make vp the *Ecliptique*.

The two vttermoſt are the two *Tropiques*: That which is fartheſt from the Style, touching the *Ecliptique* in the beginning of ♑, is therefore called the *Tropique* of *Capricorne*.

That which is neerer the Style touching the *Ecliptique* in the beginning of ♋, is the *Tropique* of *Cancer*.

The other intermediate *Redde Lines*

drawne betweene the *Aequator* and the *Tropiques* are *Parallels* of *Declination*, numbred at the *Meridian*, with 5, 10, 15, 20, according to their diſtance from the *Aequator*. The vſe of them may be,

## 1. *To ſhew the Declination of the Sun by the ſhadow of the Style.*

WHen the *Sunne* ſhineth, obſerue the ſhadow of the point of the Style among the *Red lines*. If it fall on the *Aequator*, the *Sunne* is at one of the *Æquinoctiall points*, either the beginning of ♈ or of ♎, and ſo hath no *declination*. If it fall on the *Tropique* of *Cancer*, the *Sunne* is at the higheſt, and the day at the longeſt. If on the *Tropique* of *Capricorne*,, the *Sunne* is at the loweſt, and the dayes at the ſhorteſt. If it fall on any of the *Parallel lines* betweene the *Aequator* and the *Tropiques*, the diſtance of that line from the *Aequator*, ſhall bee the *declination* of the *Sunne*.

As, if the ſhadow of the top of the

ſtyle ſhall fall on any part of the tenth *Parallel* aboue the *Aequator*, it ſhewes, the *Sunne* to be at 10.*gr.* of *South declination*: If on the twentieth *Parallel* belowe the *Aequator*, then is the *declination* of the *Sunne* 20.*gr.* from the *Aequator Northward.*

## 2. *To ſhew the day of the moneth, by the ſhadow of the ſtyle.*

THe ſhadow of the point of the ſtyle will ſhew the *declination*; and the line of ***Declination*** will leade you to the *Day of the Moneth*, at the ***Margent*** of the *Concaue.*

As, if the ſhadow of the top of the ſtyle ſhall fall on any part of the thirteenth *Parallel* aboue the *Aequator*, it ſhewes the *Sunne* to bee at 13 *gr.* of ***South declination***; and that ***Parallel*** of ***declination*** will leade you to the fourth of *February*, on the Weſt ſide, and to the ſeuenteenth of *October* on the Eaſt ſide of the *Concaue* : But, which of theſe two is the true day of the moneth, muſt bee knowne, either by the time of the yeere, or the ſecond dayes obſeruation.

## 3. *To ſhew the Place of the Sunne by the ſhadow of the Style.*

THe ſhadow of the point of the ſtyle will ſhew the *Declination*; and the interſection of the *Parallel* of *Declination*, with the *Ecliptique*, will bee the *Place of the Sunne.*

As, if the ſhadow of the top of the ſtyle fall on 13, *gr.* of *South Declination*, this *Parallel* of *Declination* will croſſe the *Ecliptique* neere 26 *gr.* of ♒, on the one ſide, and about the fourth of ♏ on the other ſide of the *Concaue*: But, which of theſe two is the true *Place of the Sunne*, will bee knowne by the day of the moneth neereſt vnto the *Signe* of the *Sunne.*

4 To

## 4. *To ſhew the Houre and Minute of the* Sunnes riſing *and* ſetting, *by the ſhadow of the* Style.

THe ſhadow of the top of the Style will ſhew the *Declination*, and the houre-line, which meetes that ***Parallel*** of ***Declination*** at the ***Horizon*** (here repreſented by the edge of the ***Margent***) ſhall giue the ***houre*** and ***minute*** of the *Sunnes riſing* and *ſetting*.

As, if the Shadow of the top of the Style fall on 13. gr. of *South declination*, that ***Parallel*** of ***Declination***, being followed to the ***Horizon*** at the Weſt ſide of the *Concaue*, will there meete at the houre-line of ſeuen, and eight Minutes, and, ſuch is the time of the ***Sunnes riſing***. Then follow this ***Parallel***, to the ***Horizon***, vnto the Eaſt ſide of the *Concaue*, and it will there meete with the ***houre-line*** of IIII. and 52. Min. which is the time of the *Sunnes ſetting*. And the line betweene 7. *Ho.* 8. *Min.* in the morning, and 4. *Ho.* 52. *Min.* after noone, is the length of the *Day*.

## 5. *To find the* Declination *of the* Sunne *by knowing the day of the moneth.*

FIrſt, find the *Day* of the *Moneth* in the inner Circle of the *Margent*; then, looke among the Red lines for the *Parallel* of *Declination*, which is drawen vp to that *Day*: the diſtance of that *Parallel*, from the *Aequator*, ſhall ſhew you the *Declination* of the *Sunne*.

As, if it were required, to finde the *declination* of the *Sunne*, for the fourth day of *February*: the *Parallel* drawen vp to this day will be found about 13 gr. aboue the *Aequator*: And ſuch is the *Declination* of the *Sunne* to the *Southward*.

6. *To*

## 6. *To finde the* Place *of the* Sun *by knowing the* Day *of the moneth.*

THe *Day* of the Moneth will giue the *Declination* of the *Sunne*; and the *Parallel* of *Declination*, will croſſe the *Ecliptique* in the *Place* of the *Sunne.*

As, if the *Day* giuen be the fourth of *February*, the *Parallel* of *Declination* will be found to be 13. gr. *Southward*; and this *Parallel* doeth croſſe the *Ecliptique* in the 26. gr. of ♒: which is the *Place* of the *Sunne* required.

## *The vſe of the Blue lines.*

THe vſe of the *Blue lines* drawen from the bottome to the edge of the *Concaue* is, to repreſent the *Verticall circles*, commonly called by the *Arabian* name, *Azimuthes.* Theſe are, all, great Circles, drawen through the *Zenith* and the *Nadir*, and doe diuide the *Horizon* into æquall parts. The *Meridian* is one of them: But, the prime *Verticall circle* is that, which is drawen from Eaſt to Weſt. Theſe two diuide the *Horizon* into foure æquall parts: Each of theſe parts is diuided, by Sea-men, into eight; and ſo, the whole into thirtie two points of the *Compaſſe*. But, *Aſtronomers* diuide each fourth part into 90. *Degrees*. I haue here ſet the points of the *Compaſſe* in the bottome of the *Concaue*, and at the *Margent*; and the *Aſtronomicall* diuiſions, betweene the *Tropiques*. The vſe of them may be,

## 1. *To ſhew the* Azimuth *or Point of the* Compaſſe, *whereon the* Sunne *beareth from vs; how farre he is from the South; how neere to the Eaſt or Weſt; and that, by the ſhadow of the Style.*

WHen the *Sunne* ſhineth, obſerue, where the ſhadow of the vpright edge of the ſtyle falleth among the *Azimuth lines*, the diſtance of that line from the *Meridian*, ſhall ſhewe the *Azimuth*, whereon the Sunne beareth.

As, if on the fourth of *February* about 10. Ho. 5. Min. in the morning, the ſhadow of the vpright edge of the ſtyle fall on the third of the *Blue lines* from the *Meridian*, then is the Sunne 30. gr. from the South. If you follow this *Blue line* vnto the margent, it will there point betweene N W by N, and N N W wherefore it beareth from you on the contrary point betweene S E by S, and S S E.

## 2. *To find on what* Azimuth *or Point of the* Compaſſe *the Sunne riſeth or ſetteth.*

FIrſt find the day of the moneth in the inner circle of the *Margent*: then look among the *Blue lines* for the *Azimuth* which is drawen vp to the day: the diſtance of that line from the line of Eaſt

and

and Weſt, ſhall giue the *amplitude* of the *Sunnes riſing* and *ſetting*. If the day fall on the Weſt ſide of the *Concaue*, the point oppoſite to the day, is the true point of the *Sunnes riſing*: If the day fall on the Eaſt part of the *Concaue*, the point oppoſite to the day, is the true point of the *Sunnes ſetting*.

As, if the day propoſed were the fourth of *Februarie*: This moneth is found on the Weſt part of the *Concaue*, and the day falleth neere the point of W N W, whoſe oppoſite point is E S E, the point of the *Compaſſe* whereon the *Sunne riſeth*. Or, if you looke among the *Blue lines* in the *Concaue*, you ſhall finde the *Azimuth* which is drawen vp to the day, to be about 21 gr. from the line of Eaſt and Weſt; which ſhewes, that the *Amplitude* of the *Sunnes riſing* is about 21 gr. from the Eaſt.

The like reaſon holdeth for all other times of the yeere, as may appeare by comparing the *Concaue* with the *Table* following.

The *Concaue* and this Table, are both made for the *Latitude* of 51 *gr.* 30 *Min.* ſeruing for *London*, and ſuch places as lie Eaſt or Weſt from *London* in the ſame *Latitude.* But, if you goe from *London* either Northward or Southward, there will bee ſome ſmall difference.

For, here at *London* the greateſt *Amplitude* is 39 *gr.* 50 *min.* that is, when the dayes are at the longeſt, the *Sunne riſeth* 39 *gr.* 50 *min.* from the Eaſt Northward; and *ſetteth* 39 *gr.* 50. *min.* from the Weſt Northward: when the dayes are at the ſhorteſt, he *riſeth* 39 *gr.* 50 *min.* from the Eaſt Southward, and *ſetteth* as much from the Weſt Southward.

About *Sillie* and the *Lizard*, the Southermoſt parts of *England*, in the *Latitude* of 50 *Degr.* the greateſt *Amplitude* will be 38 *Degr.* 20 *min.*

## *A Table of Amplitudes for the riſing and*

| Day. | *Ianuary* |  | *February* |  | *March.* |  | *April.* |  | *May.* |  | *Iune.* |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  | *Gr.* | *Mi.* | *Gr.* | *Mi.* | *Gr.* | *Mi.* | *Gr.* | *Mi.* | *Gr* | *Mi.* | *Gr.* | *Mi.* |
| 1 | 36 | 39 | 23 | 45 | 5 | 37 | 13 | 46 | 29 | 48 | 39 | 12 |
| 2 | 36 | 20 | 22 | 11 | 4 | 59 | 14 | 22 | 30 | 15 | 39 | 20 |
| 3 | 36 | 0 | 21 | 37 | 4 | 21 | 14 | 57 | 30 | 41 | 39 | 27 |
| 4 | 35 | 41 | 21 | 3 | 3 | 43 | 15 | 32 | 31 | 7 | 39 | 33 |
| 5 | 35 | 21 | 20 | 28 | 3 | 5 | 16 | 8 | 31 | 32 | 39 | 38 |
| 6 | 35 | 0 | 19 | 53 | 2 | 27 | 16 | 43 | 31 | 57 | 39 | 42 |
| 7 | 34 | 39 | 19 | 18 | 1 | 49 | 17 | 18 | 32 | 21 | 39 | 46 |
| 8 | 34 | 17 | 18 | 43 | 1 | 11 | 17 | 53 | 32 | 45 | 39 | 49 |
| 9 | 33 | 54 | 18 | 8 | 0 | 32 | 18 | 27 | 33 | 8 | 39 | 51 |
| 10 | 33 | 30 | 17 | 32 | 0 | 6 | 19 | 1 | 33 | 31 | 39 | 52 |
| 11 | 33 | 6 | 16 | 56 | 0 | 44 | 19 | 35 | 33 | 53 | 39 | 52 |
| 12 | 32 | 41 | 16 | 20 | 1 | 22 | 20 | 10 | 34 | 15 | 39 | 51 |
| 13 | 32 | 16 | 15 | 44 | 2 | 0 | 20 | 39 | 34 | 36 | 39 | 50 |
| 14 | 31 | 50 | 15 | 7 | 2 | 38 | 21 | 15 | 34 | 56 | 39 | 49 |
| 15 | 31 | 23 | 14 | 30 | 3 | 16 | 21 | 48 | 35 | 16 | 39 | 46 |
| 16 | 30 | 57 | 13 | 54 | 3 | 54 | 22 | 20 | 35 | 35 | 39 | 42 |
| 17 | 30 | 29 | 13 | 17 | 4 | 31 | 22 | 53 | 35 | 54 | 39 | 37 |
| 18 | 30 | 1 | 12 | 40 | 5 | 9 | 23 | 25 | 36 | 12 | 39 | 32 |
| 19 | 29 | 33 | 12 | 3 | 5 | 47 | 23 | 56 | 36 | 29 | 39 | 26 |
| 20 | 29 | 4 | 11 | 25 | 6 | 25 | 24 | 28 | 36 | 46 | 39 | 20 |
| 21 | 28 | 34 | 10 | 48 | 7 | 2 | 24 | 59 | 37 | 2 | 39 | 13 |
| 22 | 28 | 4 | 10 | 11 | 7 | 39 | 25 | 30 | 37 | 18 | 39 | 5 |
| 23 | 27 | 34 | 9 | 33 | 8 | 16 | 26 | 0 | 37 | 32 | 38 | 56 |
| 24 | 27 | 4 | 8 | 55 | 8 | 53 | 26 | 30 | 37 | 46 | 38 | 46 |
| 25 | 26 | 33 | 8 | 17 | 9 | 30 | 27 | 0 | 37 | 59 | 38 | 36 |
| 26 | 26 | 1 | 7 | 39 | 10 | 7 | 27 | 29 | 38 | 12 | 38 | 25 |
| 27 | 25 | 29 | 7 | 2 | 10 | 44 | 27 | 58 | 38 | 24 | 38 | 13 |
| 28 | 24 | 57 | 6 | 15 | 11 | 21 | 28 | 26 | 38 | 35 | 38 | 0 |
| 29 | 24 | 25 |  |  | 11 | 58 | 28 | 54 | 38 | 45 | 37 | 47 |
| 30 | 23 | 52 |  |  | 12 | 34 | 29 | 21 | 38 | 55 | 37 | 33 |
| 31 | 23 | 18 |  |  | 13 | 10 |  |  | 39 | 4 |  |  |

*ſetting of the Sunne, euery day of the yeere.*

| *Iuly.* | | *Auguſt.* | | *Septemb.* | | *October.* | | *Nouemb.* | | *Decemb.* | | *Day.* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Gr.* | *Mi.* | *Gr.* | *Mi.* | *Gr.* | *Mi.* | *Gr.* | *Mi.* | *Gr.* | *Mi.* | *Gr.* | *Mi.* | |
| 37 | 18 | 25 | 4 | 7 | 15 | 11 | 32 | 29 | 3 | 39 | 6 | 1 |
| 37 | 3 | 24 | 33 | 6 | 38 | 12 | 9 | 29 | 32 | 39 | 15 | 2 |
| 36 | 47 | 24 | 2 | 6 | 1 | 12 | 46 | 30 | 0 | 39 | 23 | 3 |
| 36 | 30 | 23 | 31 | 5 | 24 | 13 | 23 | 30 | 28 | 39 | 30 | 4 |
| 36 | 13 | 22 | 59 | 4 | 47 | 13 | 59 | 30 | 56 | 39 | 36 | 5 |
| 35 | 55 | 22 | 27 | 4 | 9 | 14 | 36 | 31 | 23 | 39 | 41 | 6 |
| 35 | 36 | 21 | 55 | 3 | 31 | 15 | 12 | 31 | 49 | 39 | 45 | 7 |
| 35 | 17 | 21 | 22 | 2 | 54 | 15 | 48 | 32 | 15 | 39 | 48 | 8 |
| 34 | 57 | 20 | 49 | 2 | 16 | 16 | 24 | 32 | 40 | 39 | 50 | 9 |
| 34 | 37 | 20 | 16 | 1 | 39 | 17 | 0 | 33 | 5 | 39 | 51 | 10 |
| 34 | 16 | 19 | 43 | 1 | 1 | 17 | 36 | 33 | 29 | 39 | 52 | 11 |
| 33 | 55 | 19 | 9 | 0 | 23 | 18 | 11 | 33 | 52 | 39 | 52 | 12 |
| 33 | 33 | 18 | 35 | 0 | 15 | 18 | 46 | 34 | 15 | 39 | 50 | 13 |
| 33 | 10 | 18 | 1 | 0 | 53 | 19 | 21 | 34 | 37 | 39 | 48 | 14 |
| 32 | 47 | 17 | 27 | 1 | 30 | 19 | 56 | 34 | 59 | 39 | 45 | 15 |
| 32 | 23 | 16 | 52 | 2 | 8 | 20 | 31 | 35 | 20 | 39 | 41 | 16 |
| 31 | 59 | 16 | 17 | 2 | 46 | 21 | 5 | 35 | 40 | 39 | 36 | 17 |
| 31 | 35 | 15 | 42 | 3 | 24 | 21 | 39 | 36 | 0 | 39 | 30 | 18 |
| 31 | 10 | 15 | 7 | 4 | 1 | 22 | 13 | 36 | 19 | 39 | 23 | 19 |
| 30 | 44 | 14 | 32 | 4 | 39 | 22 | 47 | 36 | 37 | 39 | 15 | 20 |
| 30 | 18 | 13 | 56 | 5 | 17 | 23 | 20 | 36 | 55 | 39 | 7 | 21 |
| 29 | 52 | 13 | 20 | 5 | 54 | 23 | 53 | 37 | 12 | 38 | 58 | 22 |
| 29 | 25 | 12 | 44 | 6 | 32 | 24 | 26 | 37 | 28 | 38 | 48 | 23 |
| 28 | 57 | 12 | 8 | 7 | 10 | 24 | 58 | 37 | 43 | 38 | 37 | 24 |
| 28 | 29 | 11 | 32 | 7 | 48 | 25 | 20 | 37 | 57 | 38 | 25 | 25 |
| 28 | 1 | 10 | 56 | 8 | 26 | 26 | 2 | 38 | 11 | 38 | 12 | 26 |
| 27 | 32 | 10 | 20 | 9 | 3 | 26 | 33 | 38 | 23 | 37 | 58 | 27 |
| 27 | 3 | 9 | 43 | 9 | 41 | 27 | 4 | 38 | 35 | 37 | 44 | 28 |
| 26 | 34 | 9 | 7 | 10 | 18 | 27 | 34 | 38 | 47 | 37 | 29 | 29 |
| 26 | 4 | 8 | 30 | 10 | 55 | 28 | 4 | 38 | 57 | 37 | 13 | 30 |
| 25 | 34 | 7 | 53 | | | 28 | 34 | | | 36 | 56 | 31 |

About the North of *England* in the *Latitude* of 55 *Degr.* 40 *Min.* the greateſt *Amplitude* will be 45 *Gr.* And ſo, when the dayes are at the longeſt, the *Sunne* will *riſe* due *North-Eaſt*, and *ſet* in the *North-weſt.* When the dayes are at the ſhorteſt, he will *riſe* in the *South-eaſt*, and *ſette* in the *South-weſt.*

About the North of *Scotland* in the *Latitude* of 60 *Gr.* the greateſt *Amplitude* will be about 52 *Degr.* 50 *Min.* And, after you come to 66 *degr.* of *Latitude*, you may ſee the *Sunne* in the *North.*

## 3. *To find the* Azimuth *or Point of the* Compaſſe *whereon the* Sunne *beareth, for all houres of the day, at any time of the yeere.*

THe *time of the yeere* is here repreſented by the *Red Parallel lines* of *Declination*; the *time of the day*, by the *Blacke houre-lines.* Firſt, find, where theſe two doe meete, and then ſee, which of the *Blue lines* would paſſe through that interſection; The diſtance of that *Blue line* from the line of Eaſt and Weſt ſhall giue the *Azimuth* required.

As, if the *day* propoſed were the ſixth day of April, and it were required to know the *Azimuth* whereon the *Sunne* beareth at 9. Ho. 45. Min. in the morning. This moneth is found on the Weſt part of the *Concaue*, and the *Parallel* of *Declination* drawen vp to the ſixth day of this moneth, is about 10 Degrees diſtant from the *Æquator*: This *Parallel* doth croſſe the *houre-line* of 9 Ho. 45 Mi. in the middle betweene two *Blue Azimuth lines*, and following this middle vnto the *Margent*, I find there, it directs me to the point N W, in the inner circle, and ſo, to 45 Degr. from the Weſt in the middle Circle of the *Margent*, which ſhewes, that the *Sunne* is in the oppoſite point 45 degr. diſtant from the Eaſt, vpon the Southeaſt point of the *Compaſſe*.

## 4. *To finde the* Houre *and* Minute *when the Sun ſhall come to any* Azimuth, *at all times of the yeere.*

AS, if it were required, to know, at what houre the *Sunne* would be in the Eaſt, on the *longeſt day* of the yeere.

The *Sunne riſeth* in the Eaſt, at VI. in the morning, and *ſetteth* in the Weſt, at VI. in the euening, about the tenth of *March*, and the thirteenth of *September*: but, all other times of the yeere, it will be paſt VI. in the morning before hee come to the Eaſt, and he will be paſt the Weſt before VI. of the clocke in the euening. As here the *Tropique* of *Cancer*, which is the *Parallel* of the *longeſt day*, doth croſſe the Weſt *Azimuth* at 7. *Ho.* 22. *Min.* in the morning; And ſuch is the time of the *Sunnes* comming to the Eaſt.

## 5. *To find the Day of the Moneth when the Sunne commeth to any Point of the Compaſſe at any houre propoſed.*

AS, if it were required, to find the *day* of the moneth when the Sunne ſhall come to due Eaſt, at VII. in the morning; I ſhall finde that the *houre-line* of VII. in the morning doeth croſſe the Weſt *Azimuth* at the *Parallel* of 18. degr. of North *Declination*; and this *Parallel* doth leade me to the firſt of *May* on the Weſt ſide, and to the two and twentieth of *Iuly*, on the Eaſt ſide of the *Concaue*: which ſhewes, that the Sun will be due Eaſt at ſeuen in the morning, and due Weſt at fiue in the euening, both, on the firſt of *May*, and the xxij^th^ of *Iuly*.

## *The vſe of the Yellow lines.*

THe *Yellow lines* are, all of them, leſſer Circles, drawen vpon the ſame center in the bottome of the *Concaue*; and ſo, *Parallel* one to the other; repreſenting the *Parallels* of *Altitude*, commonly called, by the *Arabian* name, *Almicanters.* There be ſixtie two of them; and they be numbred, both at the *Meridian*, and at the *Tropique* of *Cancer*, in *Yellow Figures* with 5, 10, 15, &c. according to their diſtance from the *Horizon*, which is heere repreſented by the edge of the *Concaue*. The vſe of them is,

## 1 *To finde the* Altitude *of the* Sunne *aboue the* Horizon.

WHen the Sunne ſhineth, obſerue the ſhadow of the Style, that falleth among the *Yellow lines*; The diſtance of that *Yellow Parallel* from the *Horizon* ſhall giue the *Parallel* of the Sunnes *altitude* aboue the *Horizon*.

As, if the ſhadow of the top of the Style ſhall fall on any part of the tenth *Parallel*, it ſhewes the Sun to be at 10 *gr.* of *altitude* aboue the *Horizon*. And ſo, in the reſt.

2. *To finde the* Altitude *of the Sunne for any Day and Houre propoſed.*

3. *To finde the* Altitude *of the Sunne for any Day and* Azimuth *propoſed.*

4. *To finde the* Altitude *of the Sunne for any Houre and* Azimuth *propoſed.*

THeſe and ſuch like Propoſitions, with their *conuerſes*, depend vpon the meeting of theſe *Yellow lines* at the interſection of any two of the other lines before deſcribed.

As, if it were required, to find, what *altitude* the Sunne ſhall haue, on the ſixt day of April at nine of the clocke in the morning. Firſt, find the *Parallel* of *declination,* belonging to the Day, and his interſection with the houre of nine in the morning; then may you finde, the

*Yellow line* drawen through this interſection to be neere 35 Degr. diſtant from the edge of the *Concaue*; And, ſuch will be the *altitude* of the Sunne aboue the *Horizon*, at the time propoſed. The like reaſon holdeth for all the reſt.

## *The vſe of the Greene lines.*

IT was the maner of the Ancients, to diuide the day into twelue houres, and the night into other twelue houres: but, the houres of the day were commonly either longer or ſhorter then the houres of the night, and the Summer houres alwayes longer then the Winter houres: whereupon, they are called the *olde*, *vnæquall*; and (by ſome) the *Planetarie houres*.

Theſe houres, for the day, are heere repreſented by the *Greene lines*, and are numbred in *Greene figures* by 1, 2, 3, 4, &c. at the *Tropique* of *Capricorne*. The vſe of them is,

1. *To*

## 1. *To finde the* olde, vnæquall *houre of the day.*

WHen the Sunne ſhineth, obſerue the ſhadow of the top of the *ſtyle*, among the *Greene lines*; the line next after the ſhadow ſhall giue the houre required.

As, if the ſhadow of the top of the Style ſhall fall betweene the *Horizon* and the *Greene line* noted with 1, it is the firſt houre: If betweene the firſt houre-line and the ſecond, it is the ſecond houre: If it fall directly on the ſecond houre, it is the ſecond houre complete, according to the accompt of the Ancients.

## 2. *To compare the* old vnæquall *houres with the houres of the Clocke.*

AS, if it were required, to know, what *houre of the day*, it would be, at *nine* of the clocke in the morning vpon the longeſt day.

Firſt,

Firſt, finde the *Parallel* of the day, and his interſection with the houre of IX, then may you finde this interſection to fall betweene the third and the fourth of the *greene lines*; and ſo it is the *fourth houre* of the *Day*. For, when the dayes are at the longeſt with vs, the firſt houre beginneth at III of the clocke and 47 *Min.* in the Morning, and endeth at V and 9 *Min.* The ſecond houre beginneth where the firſt endeth, and is complete at VI and 31 *Min.* The third houre is complete at VII and 53 *Min.* The fourth, at IX and 15 *Mi.* The fift, at X and 37 *Mi.* The ſixt houre alwayes endeth at high noone: and the reſt in the like order: each of theſe twelue Houres beeing equall to 1 *Ho.* 22 *Min.* of the Clocke.

At the two *Aequinoctiall* dayes, when the Sunne riſeth at ſixe, and ſetteth at ſixe, theſe houres of the day will bee equall to the houres of the Clocke: But, in the depth of Winter, one of theſe houres, will be but 38 Minutes of a common houre.

*The*

## *The vſe of the Circle of the Age of the Moone.*

THe Circle drawne at the roote of the Style, diuided with blacke ſtrokes into 29½, repreſenteth the Age of the Moone: The other Circle within it, diuided with white ſtrokes into 24, repreſenteth the Houres of the Day, and beeing continued, would agree with the Houre lines betweene the *Tropiques*.

The vſe of theſe Circles, is;

### 1. *Knowing the Age of the Moone, to finde the time when ſhe commeth to the South.*

FIrſt, finde the Age of the Moone in the outward Circle, ſo, the next Houre line, in the inward Circle, ſhall giue you the time when ſhe commeth to the South.

Thus, you may find, that if the Moone

be ten dayes old, ſhe wil be in the South, at eight of the Clocke in the Euening: If fifteene dayes old, then about twelue of the clocke at midnight: If twenty fiue dayes old, then at eight in the Morning: And vpon this it followeth;

## 2. *Knowing the Age of the Moone, to find the time when it will bee high water.*

FIrſt, inquire what difference there is betweene the time of the Moones comming to the *South*, and the time of High water; for, that once knowne, is knowne for euer. For example, It is commonly ſayd, that when the Moone commeth to the Southweſt, it will bee High water at *London* bridge; and this is about three houres after her comming to the South. And againe when ſhee commeth to the Northeaſt, which is about three houres after her comming to the North part of the *Meridian*.

Suppoſe then, that the Moone is ten dayes old, then will ſhe be in the South, by the former Propoſition, at Eight in the Euening, or in the North at Eight in the Morning, adde vnto this three houres more, and it will be High water at Eleuen of the Clocke.

## 3. *Knowing the Age of the Moon, to finde the houre of the night, by the ſhadow of the* Style.

THe houre of the Moone from the *Meridian*, may bee found out at any time when the Moone ſhineth; by the ſhadow of the Style, in ſuch ſort as we finde the houre of the Day when the Sunne ſhineth. For, if the Moone bee in the South, ſhee will caſt the ſhadow of the Style vpon the houre of XII; and if ſhee caſt a ſhadow vpon I, or II, it ſhewes that ſhee is accordingly either one houre, or two, or more paſt the *Meridian*.

Suppoſe the Moone to be ten dayes

old, and that ſhe did caſt a ſhadow vpon the houre of V after noone; I would then ſay it were about one of the clocke in the morning: For, the Moone being ten dayes old, ſhe commeth to the South at VIII in the Euening, and therefore, when ſhee is fiue houres paſt the South, it muſt bee I, in the morning.

## *The deſcription and vſe of the four Corner Dials.*

THe foure *Triangular Dials* at the Corners of the Stone, decline from the prime *verticall*, and incline to the *Horizon*.

In theſe, The Blacke lines ſhew the ordinary Houres: the Redde lines ſhew the Summer, and Winter, and the Æquinoctiall ſhadow.

If the ſhadow of the top of the Style ſhall fall vpon the middle Red line noted with ♈ and ♎, then is the Sunne in the Æquinoctiall:

It falleth vpon the Line noted with

♋, in the height of Summer; and vpon the Line noted with ♑, in the depth of Winter.

1 The Blue lines at the Northeaſt Corner, noted with 1,2,3,4,&c. ſhewe the Houres from the Sunne riſing. The ſhadow of the top of the Style will fall vpon the Line of 1, at one houre after the Sunne riſing, and vpon the houre of 2, when the Sunne is two houres high in the Eaſt.

2 The Blue lines at the Northweſt Corner, noted with 1,2,3,4,&c. ſhew the houres from Sunne ſetting. The ſhadow of the top of the Style will fall vpon the Line of 2, when the Sunne is two houres high in the Weſt: and vpon the Line of 1, when the Sunne wants but one houre of ſetting.

## *The deſcription and vſe of the Dials on the South ſide of the ſtone.*

THe *South ſide* of the ſtone hath many Dialls:

One great *Verticall Diall*:

Two *Æquinoctiall Dials*, whereon the Sunne neuer ſhineth but in Winter:

One *Verticall Concaue* in the middle:

Two *Declining Dials*, on either ſide of this *Concaue*:

Two ſmall *Polar Concaues*:

Two *Irregular Dials*, with three Styles in each *Diall*:

Of theſe, the *Æquinoctiall*, the *Decliners*, and the *Irregular Dials* haue onely Blacke lines to ſhewe the Ordinary Houres: But the great *Verticall*, and the three *Concaues*, as they haue lines of different colours, ſo they are ſuch as were not on the former Stone.

The Lines drawne on the great *Verticall*, may be knowen & diſtinguiſhed in this maner: The *Æquator*, the *Tropiques* and the *Parallels* of the length of the day, are all drawne in Red lines: The *Houre-lines* from the *Sun-riſing*, in *Yellow*: The *Italian houre-lines* from the laſt *Sun-ſetting* in Blue. And ſo much is there intimated in foure Latine verſes:

Vmbrarum metas, Occaſum *Solis &* Ortum,
*Et* quàm longa dies, *Linea rubra dabit*:
Flaua, à Sole oriente *horas*; à Sole cadente,
Cærulea, *Italico*, Linea, *more*, *notat*.

## *The vſe of the Red Lines in finding,*

1. *The Length of the Day.*
2. *The Time of the Sunnes riſing.*
3. *The Time of the* Sunnes *ſetting.*

ALl varietie of ſhadowes is bounded betweene the two extreme *Redde Lines.*

The vppermoſt, noted with ♑, repreſenteth the *Tropique* of *Capricorne*: And when the ſhadow of the top of the *Style* ſhall fall on this line, then is the *Sunne* at the loweſt, and the *Dayes* at the ſhorteſt.

The lowermoſt, noted with ♋. is the *Tropique* of *Cancer*: when the ſhadow commeth to this line, then is the *Sunne* at the higheſt, and the dayes at the longeſt.

The other *Red lines*, noted in the middle with 8, 9, 10, 11, 12, 13, 14, 15, 16, are *Parallels* of the length of the Day.

The ſtreight line drawen in the middle, noted with ♈ and ♎, is the *Æquinoctiall.* Vpon this line is written, 6 at the one end, 12 in the middle, and 6 at the other end. This ſhewes, that when the ſhadow of the top of the *Style* ſhall fall on this line, then is the *Sunne* in the *Æquinoctiall*; the *length* of the *Day* is twelue houres; the ***Sunne*** *riſeth* at V I, and *ſetteth* at V I. In like manner, If the ſhadow ſhall fall vpon the line noted with 10; it ſheweth, that the *length* of the *day* is ten houres; the ***Sunne*** *riſeth* at VII in the morning, and *ſetteth* at V, in the euening.

At the end of theſe *Red lines*, are the *Signes* and the *Moneths*; thereby to ſhew the *Place* of the *Sunne*, and the *Time* of the *Yeere*. As, at the one ende of the *Aequinoctiall*, there is the Signe of *Aries*, and the Moneth of *March*: at the other end, the Signe of *Libra*, and the Moneth of *September* : which ſhew, that in theſe moneths, the *Sun* will be in theſe *Signes*, the ſhadow will fall on theſe *Paraliels*, and there ſhew the *length of the Day*, as before. *Et è conuerſo.*

## *The vſe of the Yellow* Lines; *in ſhewing the houres paſt ſince the Sunne-riſing.*

THe ſtreight line drawen betweene the *Blue* and the *White* grounds repreſenteth the *Horizon*: for when the *Sunne* commeth to the *Horizon*, either at his *riſing*, or at his *ſetting*, the ſhadow of the top of the Style will fall vpon this line.

The *Yellow lines* noted with 1, 2, 3, 4, &c. doe ſhew the houres after the *Sun-riſing*, according to the diſtance from the *Horizon*.

As, if the ſhadow of the top of the *Style* ſhall fall on any part of the *yellow line* noted with 1, it ſhewes, that the *Sunne* is an houre high: If on the like line noted with 2, then are there two houres paſt, betweene that and the time of the *Sunnes riſing.*

## *The vſe of the Blue Lines in ſhewing the houres paſt ſince the laſt Sunne-ſetting.*

IN *Italy* (as Trauailers ſay) the Clocke ſtrikes twentie foure at *Sunne ſetting*; at one houre after, it ſtrikes one; and then, two, three, and ſo forward vntill the next *Sunnes ſetting.* So that, if the day ſhall be eight houres long, it will ſtrike ſixteene at *Sunne riſing*, and twenty at high noone: If the day ſhall be ſixteene houres long, it will ſtrike eight at *Sunne-riſing*, and ſixteene at high noone. Theſe houres are heere repreſented in *Blue lines.*

As, if on the tenth of our April, at X of our clocke in the morning, you obſerue the ſhadow of the top of the Style, you ſhall find it to fall among the

*Red lines* on the *Parallel* of 14; on the line of 5, among the *Yellow lines*; and, on the line of 15, among the *Blue lines*: which ſhewes, that the *length of that Day* is 14 houres; and the *time of the Day*, 5 houres from the *Sunnes riſing*, and 15 houres from the laſt *Sunnes ſetting*.

In the *Verticall Concaue*, at the middle of the South ſide of the Stone, this verſe is written:

Horæ vulgares, *&* Signa in culmine cœli.

The lines there drawen are of three ſorts: The *common houre-lines* are drawen in *Blacke*: The *Aequator* and *Tropiques* drawen in *Redde*, as in the other Dials. The other lines noted with ♈, ♉, ♊, &c. are the lines of the twelue *Signes*.

## *To ſhew, which of the xij Signes is in the Meridian.*

ALl the twelue *Signes* doe paſſe, by the *Meridian*, in xxiiij houres, but, vnæqually; ſome, in leſſe time then two houres; ſome in more.

When the *Sunne* ſhineth, obſerue, where the ſhadow of the toppe of the Style falleth among theſe *lines* of *Signes*; for, that ſheweth the *Signe* which is then in the *South*, and ſo, paſſing by the *Meridian*.

As the *Sunne*, being in the *Aequinoctiall*, at IX of the Clocke in the morning, the ſhadow falleth vpon ♒ and ♌: If the *Sunne* be in ♈, then is the *Signe* of ♒ in the *Meridian*; If in ♎, then it is the *Signe* of ♌. But, when the *Sunne* commeth to the *Tropique* of *Cancer*, the ſhadow will fall, at IX in the morning, vpon the *Signe* of ♉; and that is the *Signe* which is then in the *Meridian*.

In the two *Polar Concaues* on the South ſide of the Stone, there are *lines* noted with theſe words, *Aequalis*, *Dupla*, *Tripla*, *Quadrupla*, &c.

The vſe of them is,

## *To ſhew the Proportion of Shadowes to their Bodies.*

AS, when the ſhadow of the top of the Style ſhall fall vpon the *line* noted with this word, *Aqualis*; then, is the ſhadow of a man, vpon a leuell ground, æquall to his height. When it falleth vpon the line noted with the word *Dupla*, then will his ſhadow be double vnto his height. And ſo, for the reſt.

Theſe Proportions being thus known, you may take the length of the Shadow, and ſo, finde the height of the body, when it cannot otherwiſe be ſo eaſily meaſured.

## *The Deſcription and Vſe of the Dials on the North ſide of the Stone.*

THe Sunne ſhineth on the North ſide of the ſtone, onely in the Summer; and then, early in the morning, before it ſhineth on the South ſide; or, late in the euening, after it hath left ſhining on the South ſide of the ſtone: And therefore I haue drawen heere ſuch lines as may anſwere to them on the South ſide.

In the *Verticall Concaue* on this North ſide, the *Red lines* ſhewe the *Signes*, and the *Place* of the *Sunne*: The *Blue lines* noted with *Dupla, Tripla, Quadrupla, &c.* doe ſhew the Proportion of ſhadowes to their Bodies.

In the two ſide *Inclining Dials*, the *Red lines*, noted with 16, 15, 14, &c. doe ſerue to ſhewe the *length of the Day*: and the *Blue lines*, the houres from *Sunne riſing* and *Sunne ſetting*.

The

## *The Deſcription and vſe of the Dials on the Eaſt and Weſt ſides of the Stone.*

THe *Sunne* ſhineth on the Eaſt ſide of the ſtone, onely in the morning; on the Weſt ſide, onely in the afternoone; and not on both at once; and therefore I haue made them one anſwering the other.

Either ſide hath foure great Dials, of ſeuerall formes: A *Meridian Plaine*; a *Meridian Concaue*; a *Meridian Cylinder Diall*; and a *Square hollow Diall* of many ſides.

Ouer the *Meridian Plaine*, on the one ſide, theſe verſes are written, ſhewing the vſe of the Lines according to their colours.

Horas antiquas, *Viridis*; *Rubra linea*, Signa
*Monſtrat*; *Cæruleus*, nautica puncta, *color*.

On the other ſide, theſe verſes, to the like effect:

*Cæruleo, dantur* communes Azimuth; Horæ Antiquæ, *Viridi*; Signa, *colore* Rubro.

THe *Red lines* doe here repreſent the *Signe* and *Place of the* Sunne. For, the *Sunne* ſhining, the ſhadow of the edge of the top of the Style falling among the *Blacke lines* will ſhew the ordinarie houres: And the ſhadow of the lower point of that edge falling among the *Red lines* will there ſhew the *Signe* of the *Place of the Sunne*, according to the characters ♈, ♉, ♊, ♋, &c. noted in the *Ellipſis*.

The *Greene lines* do ſhew the *Old, Vnæquall, Planetary houres*, diuiding the *Day* into twelue equall parts; for, the *Greene line* which followeth next after the ſhadow, will giue the houre required.

The *Blue lines*, noted with E, E b S, E S E, &c. doe ſhew the common *Azimuths*, or ( as Seamen call them ) the *Points of the Compaſſe*, whereon the *Sunne* beareth from vs. For, if the point of the ſhadow doe fall vpon the line noted with E, then is the *Sunne* in the Eaſt: If it fall on the line noted with E b S, then the *Sunne* beareth from vs Eaſt and by South.

In the *Square hollow Dialls* of many ſides, the *Blacke lines* doe ſhew the *Ordinary Houres*, and the *Redde lines* repreſent the *Aequator*, and his *Parallels* of *declination*. For, heere, if the *Sunnes* beame paſſing through the little hole in the ſide of the *Square* ſhall fall on any part of the *Red line*, 10 *gr.* aboue the *Aequinoctiall line*, then is the *declination* of the *Sunne* 10 *gr.* to the Southward: If on 20 *gr.* below the *Aequinoctiall line*, then is the *Sunne* 20 *Degrees* from the *Aequator* Northward.

In the *Meridian Concaue*, on the Eaſt ſide of the Stone, is written this verſe,

Horæ vulgares, *atq;* aſcendentia Signa.

In the *Meridian Concaue*, on the Weſt ſide,

Horæ vulgares, *&* deſcendentia Signa.

The Lines heere drawne are of three

ſortes: The *Common houre-lines* are drawne in *Blacke*: The *Aequator*, and the *Tropiques* are drawne in *Redde*, as in the other *Dials*: The other lines noted with ♈, ♉, ♊, ♋, &c. are the lines of the twelue Signes.

## *To ſhew, which of the xij Signes is at the Horizon.*

ALl the twelue Signes doe riſe and and ſette in xxiiij houres, but, vnequally: Some are neere three houres in riſing, others doe riſe in leſſe time then an houre.

Heere, it ſufficeth onely to obſerue the ſhadow of the toppe of the Style; For, it will fall vpon the *Signe*, which is riſing, if the *Sunne* ſhine on the Eaſt ſide: or vpon the *Signe* which is then deſcending, if the *Sunne* doe ſhine on the Weſt ſide of the Stone.

In the *Meridian Cylinders* are two *Geographicall Tables*: One, on the Eaſt ſide of the Stone, of ſuch places as are Eaſt from *London*: The other, on the Weſt ſide, of ſuch places as lie Weſt from *London*. And theſe are deſcribed, according to their due *Latitude* and *Longitude*, in ſuch ſort, that the ſame lines which ſhew the houre of the *Day*, doe alſo ſhew the difference of *Longitude*.

The vſe of them may bee,

### 1. *To ſhew the time, when it is noone in any of thoſe Countreys.*

SVch places as lie Eaſt from *London* haue noone before vs: Such as lie Weſt from *London* haue noone after vs.

But to finde the time more particularly, obſerue the ſhadow of the Style which ſheweth the houre of the Day; For, when that commeth to be ouer any place in the *Chart*, then is it *Noone* in that place.

Thus, the ſhadow of the Style comming to the *Meridian* of *Hieruſalem*, at the houre of IX in the morning, it ſheweth, that it is *Noone* at *Hieruſalem*, when it is but nine of the Clocke with vs at *London*.

## 2. *To ſhew the time of the Day agreeing to any of thoſe Countreys.*

FIrſt, finde the *Meridian* of the *Place* propoſed; then, ſee where the ſhadow falleth: So, the diſtance in houres, between the ſhadow and that *Meridian*, ſhall giue the *time of the Day* required.

As if, it being *Noone* at *Rome* and *Venice*, it were required to finde *the houre of the Day* at *Hieruſalem*.

It appeareth, by the former Propoſition, that it is *Noone* at *Rome* and *Venice*, at ſuch time as it is about eleuen of the Clocke at *London*, and, that there is two houres difference between the *Meridian* of *Rome* and the *Meridian* of *Hieruſalem*; and therefore, at *Hieruſalem* it is two of the Clocke after noone at the time propoſed.

And what is here ſaid of the Day, the ſame may be vnderſtood of the time of the Night. It appeareth, by the former Propoſition, that it is *noone* at *Virginia*, at ſuch time, as it is V of the Clocke after noone with vs at *London*; and therefore, fiue houres difference, betweene the *Meridians* of *Virginia* and *London*; ſo that, I ſuppoſe, if they at *Virginia*, and wee at *London*, could ſee one and the ſame thing, at the ſame inſtant of time (as ſometimes, wee may, either the beginning or the end of an Eclipſe of the *Moone*) if wee ſee it at midnight, they ſhould ſee it at VII of their Clocke in the Euening; Or, if they ſee it at VIII in the Euening, wee ſhall ſee it at One in the Morning.

These, and ſuch like, are the vſes of
theſe *Dials*: if too obſcurely
deliuered, your *Maieſtie*
may command the
Author.

FINIS.

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